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DDAS Accident Report

Accident details

Report date: 18/01/2008	Accident number: 482
Accident time: 6:16	Accident Date: 21/08/2006
Where it occurred: Schull Mountain, Schull Village, Rasht District	Country: Tajikistan
Primary cause: Inadequate training (?)	Secondary cause: Field control inadequacy (?)
Class: Excavation accident	Date of main report: 31/08/2006
ID original source: None	Name of source: TMAC
Organisation: [Name removed]	
Mine/device: PMN AP blast	Ground condition: grass/grazing area rocks/stones
Date record created:	Date last modified: 18/01/2008
No of victims: 1	No of documents: 2

Map details

Longitude:	Latitude:
Alt. coord. system:	Coordinates fixed by: GPS
Map east: 39° 01' 12.2" E	Map north: 070° 19' 33" N
Map scale:	Map series:
Map edition:	Map sheet:
Map name:	

Accident Notes

handtool may have increased injury (?)

inadequate medical provision (?)

inadequate training (?)

squatting/kneeling to excavate (?)

visor not worn or worn raised (?)

Accident report

The report of this accident was made available in 2007. Its conversion to a DDAS file has led to some of the original formatting being lost. The text of the report is reproduced below, edited for anonymity. The original files, including all Annexes, are held on record. Text in [] is editorial.

REPORT OF BOARD OF INQUIRY

INTO DEMINING ACCIDENT AT SHULL MOUNTAIN ON 21 AUGUST 2006

Dushanbe 31 August 2006

References:

- Map, General Staff Series 1984 J 42 33, Sheet no 10 42 033.
- TMAC National Mine Action Standards Dated 29 October 2005.
- [International demining group] SOP Part Four – Minefield Clearance.

INTRODUCTION

1. As a result of a mine accident on 21 August 2006, in which demining operator [the Victim] was injured, a Board of Inquiry was convened by the Tajikistan Mine Action Centre to conduct an investigation on behalf of the government, in accordance with National Mine Action Standards. The initial report of this accident is shown at Annex A.
2. The accident involved a Mine Clearance Team (MCT) from [International demining group] Dushanbe which was clearing an area of ground known to be mined, near the village of Shull, in the Rasht Valley region of Tajikistan.
3. The Board of Inquiry comprised:
 - a) Chair (CTA TMAC) [Name removed]
 - b) Member (MOD) [Name removed]
 - c) Member (TMAC) [Name removed]
 - d) Assistant [Name removed] (UNDP)
4. [International demining group] appointed one observer to the Board of Inquiry – [Name removed].
5. A copy of the Board's Terms of Reference is attached at Annex B.

SEQUENCE, DOCUMENTATION AND PROCEDURES OF TASKING

6. TMAC designates this task as TS IS 58 and a Red Task Folder has been issued for the task, in accordance with normal procedures. The first Red Task Folder was issued complete with the Impact Survey form (Tajik - original), Suspect Hazardous Area (SHA) sketch map, Impact Survey form, topographical maps 1:50,000 and 1:100,000 scales, to [International demining group] Manager, [Name removed] on 20 May 2004 by TMAC IMSMA Officer, [Name removed]. The original task started on 25 May 2004.

Contents of Red Task Folder

- Impact Survey form: TMAC
 - Impact Survey form (Tajik, Original): [International demining group]
 - Topographic Maps 1:50,000 scale: TMAC
 - Topographic Maps 1:100,000 scale: TMAC
 - Suspect Hazardous Area (SHA) sketch map: [International demining group]
7. Although it may be sometimes considered unusual to clear landmines from such areas as mountain tops, this mine clearance task is considered a priority because it is associated with grazing and farming land. The area provides approximately 300,000 square metres of ground for agriculture, based on the nearby village of Shull. The formal procedure for tasking was through the TMAC; the area was first identified after [International demining group]'s General Survey of the area in 2003/4 and the sequence of tasking originated from TMAC.
 8. From late 2005 until 2 July 2006, there was no demining activity in this location, initially due to seasonal poor weather conditions and then through delays in funding, which delayed the start of [International demining group]'s basic training courses for deminers.
 9. The team arrived on site on 2 July 2006 and set up camp on that day. Start-of-season re-marking of the area and then clearance activities began on the next day, 03 July.
 10. At the time of the accident 18 deminers were at work along with two Section Leaders and one Team Leader. On the morning of the accident the deminers began working at 0500hrs. [International demining group] working practices at this site require that each deminer normally works for fifty minutes before taking a ten-minute break and then re-starting the work-break-work routine. This has been their standard procedure since demining activities in this mine field resumed on 2 July 2006. The accident occurred at about 6:16 am.
 11. Activities on each [International demining group] task site are recorded within the pages of an [International demining group] Team Leader's Logbook. Example pages from the logbook used at this task site are shown at Annex C.
 12. National Mine Action Standards require that a copy of Standing Operational Procedures is held on each task site. One copy was available for reference at this task site.

GEOGRAPHY

13. The accident occurred near the village of Shull, in Rasht district. Lat/Lon 070° 19' 33" N, 39° 01' 12.2" E. Elevation is approximately 1950 metres above sea level. Map sheet 10 42 033. See map at Annex D.
14. The general area where the accident occurred is grassy pastureland, in a mountainous region above the western side of the village of Shull. The point of detonation occurred within a rocky outcrop inside the working area of a deminer involved in the clearance of ground as part of his normal duties at that location.
15. The minefield is situated on the top of a very steep-sided hill and the clearance lane where the accident occurred is on mixed stony and grassy ground within a rocky outcrop on the north western side of Shull Mountain.

16. The full extent of the mined area in this location is uncertain. Local information and information from MoD indicates at least 300,000 square metres are contaminated with 800 PMN mines on the area, as well as an unknown number of OZM-72 bounding fragmentation mines. The mines were originally laid to protect at least four anti-aircraft gun positions and perhaps a further four mortar positions, sited on Shull Mountain as part of local protection for Garm airport. There are no known minefield records for this area. Since 25 May 2004 approximately 50,000 square metres of ground have been cleared. Eleven OZM-72 and seven items of unexploded ordnance have been found and destroyed. No PMN mines had been found on the area prior to this accident.

[The picture below shows the rocky outcrop where the accident occurred.]



17. There is no road onto the area and to reach the minefield a very substantial walk of two kilometres, with a vertical height gain of over six hundred metres, is required.
18. The nearest inhabited buildings are at the village of Shull, approximately two kilometres away to the west from the accident site. The town of Garm is approximately ten kilometres away.
19. Weather conditions at the site on the day of the accident and during the inquiry were dry, warm and sunny and there had been no rain or cold weather during the preceding week. The ground was dry at the time of the accident.
20. The [International demining group] demining team at Shull are living in a tented camp approximately four hundred and fifty metres from the minefield and are supported by [International demining group] with sufficient primary health care, shelter and food. Water is collected on a daily basis by using a donkey to carry water in containers from a nearby mountain stream.
21. Further images of the site and the general area are shown at Annex E.

PRIORITY OF TASK

22. This task was designated as high priority by TMAC, after meetings with and representations from the local government in the area. During [International demining group]'s initial survey of the area, in 2003, local inhabitants verbally reported up to sixteen human accidents on the area. Some of these accidents have been formally reported and are recorded in the national IMSMA database. Others are anecdotal and little formal information is known about them.

SITE LAYOUT AND MARKING

23. Marking of the area between cleared and uncleared areas is in accordance with [International demining group]'s Standing Operational Procedures. Marking in clearance

lanes and elsewhere on the site was adequate, but could be improved. A plan of the site is attached at Annex F showing the areas of clearance.

24. Suggested improvements:

- e) Sign boards should be erected to show locations of medical area, detector test area etc.
- f) Mark 'Hotline' (a rolling start-line that can be advanced as land is cleared and QA on it is completed) beyond which PPE must be worn.
- g) Mark a formal Control Point, where deminers and visitors are briefed, maps are maintained and where personnel may gather in an emergency, if so instructed.

25. When the mines were laid in 1995, no marking was emplaced by the troops who put down the mines. The only marking currently on the site was placed there by [International demining group]'s demining teams and this consists of wooden pickets, plastic marking tape and mine warning triangles, in accordance with their own Standing Operational Procedures and UN International Mine Action Standards. The route from the ambulance parking place at the bottom of the hill to the task site area at the top of the hill is marked with red-painted rocks to indicate the line of the pathway.
26. The accident occurred within a marked clearance lane which was being cleared at the time of the accident. The next nearest clearance lane to where the accident occurred is 25 metres away from the point of detonation and the nearest working deminer at the time of the explosion was working in that lane.

SUPERVISION AND DISCIPLINE ON SITE

27. The mine action team working on this task live in a tented encampment on the task site area, approximately four hundred and fifty metres to the south of the main works area. [International demining group] have a total of twenty-seven personnel working on this project task site and these are managed and monitored by supervisor [Name removed], who arrived on site on 11 August 2006 to replace outgoing supervisor [Name removed] who was leaving to take up a task at another mine clearance site. Before departure [The outgoing supervisor] stayed for one day together with [the new supervisor] to ensure that he was familiar with the task site and the works there.
28. A demining team logbook was available to record visitors and routine daily events at the site. See Annex C. As well as the supervisor, the mine action unit on Shull Mountain consists of one Team Leader, eighteen deminers and support personnel as shown in the diagram below. [Diagram omitted.]
29. Routine management visits by [International demining group] quality assurance and technical supervisors are not made as regularly as they should be because expatriate personnel who should be deployed to Tajikistan are not deployed.
30. Every other night deminers have night-time sentry duty to guard the demining camp site and work area. [The Victim] was on duty between 0200hrs to 0400hrs on the morning of the accident.

QUALITY ASSURANCE

31. On-site management, supervision and Quality Assurance (QA) of works at the task site are the responsibility of the supervisor. In the August Logbook there is no page for Quality Control.
32. In support of the on-site supervisor there is normally a formal regime of internal supervision and inspection for the work of all of [International demining group]'s Mine Action Teams. Their work is also regulated by UN International Mine Action Standards (IMAS), Tajikistan National Mine Action Standards (NMAS) and the organisation's own Standing Operational Procedures (SOP).
33. [International demining group] report that their managers should routinely visit their teams and work sites on an occasional basis, approximately once each week. This should include visits either by the expatriate Project Manager, the expatriate Operations Officer or their local national counterparts. However, the only recorded visit from any senior manager or expatriate adviser to this task site was on 13 July 2006 when [Name removed], [International demining group] [national] Operations Officer made a visit to destroy an anti personnel mine which had been found on the site. This visit is shown in the site log book.
34. As well as [International demining group]'s internal Quality Control, TMAC normally inspects all task sites through the national Quality Assurance Officer. The most recent inspection by the TMAC QA Officer was on 19 July 2006. See TMAC QA Report at Annex G.
35. As part of internal Quality Control (QC) procedures, the Supervisor, Team Leader or Section Leader at the task site is required to check each area cleared to ensure that no signals are received from a metal detector when it is passed over areas which have been cleared by a deminer. In this instance Section Leader [Name removed] checked a completed five-metre long lane which had been cleared by [the Victim] immediately prior to the first morning rest break on the day of the accident and this was confirmed by Team Leader [Name removed]. To mark the limit of his QC inspection, [Name removed] marked the end of the checked lane with a green marker picket as required by [International demining group] normal working practices. The picket was still in place during the Board of Inquiry inspection of the site after the accident. [The Victim] then took his ten-minute rest break as planned and then came back to his place of work to start a new clearance lane *adjacent* to the one he had just completed.

COMMUNICATIONS

36. [International demining group]'s communications network on Shull Mountain is based on handheld VHF radios for internal contact within the task site area and mobile telephones for external contact.
37. Routine twice-daily reports are made to [International demining group]'s Dushanbe HQ office from the Shull task site by mobile telephone.
38. On the day of the accident, three mobile telephones were on site, but team leader [Name removed] called by radio to one of the vehicles at the bottom of the hill and sent the driver in it to inform the hospital at Garm that a casualty would soon be on the way to them. [The Team Leader] informed the Board of Inquiry that, at the time of the accident, this seemed the best way to inform the hospital about what was happening, but agrees that he should have called the hospital directly himself.

MEDICAL

39. One person was directly involved and injured in the accident; [the Victim], a local national Ministry of Defence deminer employed by [International demining group] who was deployed to the site as part of his routine duties managed by [International demining group] Dushanbe.
40. [The Victim] received serious blast and secondary fragmentation injuries to his face. A little over one hour after the accident occurred he was treated at Garm hospital where he received emergency surgery to stem the bleeding from his face before being evacuated by helicopter to the Russian Military Hospital in Dushanbe on the same day. A report from the Russian Military Hospital states that the casualty received the following injuries:
- h) Mine explosion trauma. Concussion of the brain.
 - i) Multiple fragmentation and penetration injuries to the face, with both eyeballs eviscerated.
 - j) Open fragmentation fracture of the left tibia with likelihood of full recovery. (Originally written as 'Open fragmentation fracture of the left shinbone with satisfactory of standing fracture').
 - k) Open fracture of middle base of phalanx on the second finger of the right hand.
 - l) Fragmentation injuries to left knee and right thigh.
 - m) Level 1 Shock.
41. Deminer [Deminer 1] was working close to the victim and, after the mine detonated, arrived at the scene of the accident first. Team Leader [Name removed] arrived immediately after. The team leader instructed another deminer who had been working nearby, [Deminer 2], to clear a path to the casualty and the area surrounding him. The casualty was then carried by fellow deminers to a designated intermediate medical treatment point on a cleared area of ground approximately one-hundred and twenty-five metres from the point of detonation where the medic from Section Number Two, [Name removed], was stationed. During the next few minutes, during which time the second medic arrived and preparations were made to treat and stabilize the casualty, the two medics treated his injuries. Medics continued to give medical attention as he was carried, on a stretcher, away from the minefield and down the mountain, towards the ambulance park two kilometres downhill.
42. All [International demining group] operations normally deploy with a qualified medic as part of the team; a comprehensive trauma and first aid pack and a fully equipped ambulance vehicle appropriate to demining operations is provided at every task site. All demining personnel receive twenty-four hours of first aid instruction as part of basic deminer training and a further 16 hours as part of annual refresher training. Medical and emergency support provided to the team involved in this accident was adequate for the circumstances. Because there is no road to the task site area, ambulances to support the team are stationed at the bottom of the mountain approximately two kilometres from the task site.
43. National standards require that a casualty evacuation exercise should be carried out immediately on first arrival at any task site and routinely at least once each month. This task started on 02 July. The on-site log book records that exercises were carried out on 10 and 22 July and on 10 and 18 August. The hand-written heading on the page of the

August logbook where this has been recorded has been altered from July to read August 2006 and the column headed 'Date' has been altered from 10.07, to read 10.08. The same entry was made by the same hand in the July logbook for 10 July. Although the Board of Inquiry consider these alterations to be worthy of note, it is accepted that that this could possibly be a simple administrative error.

44. At 0715 hours the casualty was removed from the area in the team's ambulance vehicle, driven by [Name removed], and taken to the city hospital in Garm, approximately ten kilometres from the site. Immediately on arrival at the hospital, [the Victim] was admitted to the emergency department and transferred into the operating theatre.
45. Further evacuation from Garm hospital was available by military VIP helicopter if required and helicopter availability and operations provided by the Ministry of Defence were adequate throughout the course of the medical evacuation to Dushanbe.
46. Up to 31 August 2006, injured deminer [the Victim] was unable to recall any of the events leading up to the accident which is the subject of this report. He is making progress in hospital but will remain unaware of the full extent of his injuries until doctors decide he is ready to be told. Although his face is very seriously injured, he still has his facial features and his nose and ears are intact. His lips are very badly damaged and he has lost some teeth. One eye is missing and the other eye is very seriously damaged. A full evaluation of his condition has not been made yet.

PERSONALITIES INVOLVED

47. Personnel directly involved in the accident were members of Mine Action Team No 1, from [International demining group] Dushanbe. [Table of names removed.]
48. All team members are trained and qualified deminers. All personnel have completed and passed at least one [International demining group] basic deminer training course. Most members of the team have limited experienced in mine action activities and have received instruction in first aid as part of their basic training. Deminers' job descriptions state that part of their duties is to assist with the treatment and evacuation of casualties in the event of a mine accident. Deminers' Job Description is shown at Annex H.
49. The team had been working at the area since 2 July 2006 and their last days of rest were on 30 July to 04 August. This was their second operational deployment since their basic training, which they completed just prior to their initial deployment on 2 July 2006.

EQUIPMENT AND TOOLS

50. The deminer involved in this accident was deployed with a standard-issue [International demining group] deminer's toolkit. The items mentioned below were found at the scene of the accident. Evidence at the site and interviews with team members indicate that tools were being used correctly.
51. Metal detector – Ebinger model 420H. The detector batteries were found to be flat when the board of inquiry team inspected the site on 23 August, because it had remained switched on for more than two days after the accident. On-site testing showed that the Ebinger detector is capable of locating PMN anti-personnel mines to the required depth in the type of soil encountered at this task site. When the detector was recovered from the scene of the accident a new battery was installed and, when tested, the detector appeared to be 100% effective.

52. Prodger - A stainless steel prodger was found next to the crater and it was clear that, although ready for deployment, this tool was not in immediate use at the time when the mine detonated.
53. Pin hammer, normally used for driving wooden marker pickets into the ground. This was laid neatly on the ground, next to the manual prodger tool.
54. Trowel – A stainless steel, blast-resistant trowel, manufactured by LVP Technology of South Africa, (<http://www.lvptech.com/Main.htm>) was in the crater left by the blast of the mine. The trowel was severely damaged, the final 2cm of the point of the blade is rolled back on itself and the handle is bent completely over the blade.

[The trowel before and after the accident is shown below. This is sold as blast resistant because the material does not break. However, the length is not as recommended in IMAS, the metal handguard has broken and the handgrip has been removed in the blast.]



55. Base-stick and clearance lane marking tape – The base stick and clearance lane marking tape normally used by deminers in clearance lanes was laid askew, lying diagonally across the clearance lane. It looked as though it was probably disturbed during the detonation or at some time soon afterwards. The Board of Inquiry team agreed that, taking into account the general disposition of this equipment, it seemed most likely that [the Victim] had been using the base stick in an approved manner prior to the accident.
56. All personal protective equipment (PPE) at the site conformed to Paragraph 4 of UN International Mine Action Standard 10.30, in that it was capable of protecting against the effects of an explosive blast as follows:
- n) Frontal protection. Appropriate to the activity, capable of protecting against the blast effects of 240g of TNT at 30cm from the closest part of the body.

PPE equipment used by [International demining group] in Tajikistan is provided by ROFI, of Norway. <http://www.rofi.com/>

- o) Eye protection. Capable of retaining integrity against the blast effects of 240g of TNT at 60cm, providing full frontal coverage of face and throat as part of the specified frontal protection ensemble. Facial visors used by [International demining group] in Tajikistan are manufactured by Security Devices of Zimbabwe. <http://www.secdevinc.com/>

DETAILS OF MINE INVOLVED

- 57. Bakelite, metal and rubber fragments recovered from the crater created by the blast of the explosion show that the mine involved was a Russian PMN anti-personnel blast mine. The crater left by the detonation is as would be expected from such a device. See Annex I.
- 58. A PMN anti-personnel mine is loaded with 240 grams of high explosive and a 9 gram booster charge. It is designed to be operated by 8 to 25Kg of pressure from above. [Pictures of PMN removed.]
- 59. Analysis of the crater caused by the detonation shows that the mine involved in this accident was buried at a depth of approximately 2 to 14 centimetres in the ground. The mine was inside the marked clearance lane where deminer [the Victim] was working at the time of the accident. See Annex J.
- 60. From a military point of view, the place where the mine was laid could be considered a good location on which to site a defensive position or observation post. As such, any operation to deny the land to enemy forces might be expected to emplace landmines there.

DRESS & PERSONAL PROTECTIVE EQUIPMENT

- 61. All members of the team involved were issued with their own set of personal protective equipment consisting of a blast-resistant apron and a blast-resistant visor. When [the Victim] was evacuated from the clearance lane he was still wearing his blast-resistant apron. His visor sustained some slight damage, probably as it was blown from his face; it was recovered from a point approximately three metres outside the cleared lane during the Board of Inquiry inspection of the accident site. It was also approximately three metres from where [the Victim] landed after the mine detonated. Images of [the Victim]'s Personal Protective Equipment are shown at Annex K.
- 62. Each member of the team was also wearing a pair of 100% cotton trousers and a 100% cotton jacket, issued by [International demining group]. Leather working gloves are also issued but [the Victim] was not wearing these at the time of the accident.
- 63. Polycarbonate face visor. Eye protection is essential in manual demining and each deminer is issued with a personal face shield manufactured from 5mm Polycarbonate and equipped with a head-frame made from ballistic Aramid covered with waterproof nylon. Injuries sustained by [the Victim] indicate very clearly that either he was not wearing his visor at the time the mine detonated in front of him or he was wearing the visor incorrectly. It is possible that he lifted the visor, partially or fully, away from his face in order to get a clearer view of the ground or of something else. If the visor is lifted away from the operator's face even slightly, away from the collar of the blast resistant apron

wherein it normally rests, it can provide a gap in the deminer's frontal protection through which the effects of an explosive blast may enter. See following image.

64. Deminers' protective visors are manufactured by heat-forming 5mm untreated polycarbonate in special ovens. Polycarbonate scratches and marks easily if not looked after very carefully and can become difficult to see through clearly. Although minor scratches and marks do not significantly degrade the visor's performance against the effects of explosive blast, Polycarbonate degrades in sunlight and the UN Mine Action Service recommends that visors should usually be replaced each year.
65. The blast resistant visor is the crux of this investigation. During the Board of Inquiry's time at the demining task site and the scene of the accident, a number of visors were observed by each member of the team. Some were in good condition, others were less so. If a visor is clear and clean and unmarked it is obviously easier to see through and there will obviously be less temptation for a deminer to lift his visor to attain a better view of his work or surroundings.
66. Protective facial visors are notoriously difficult to wear and deminers universally do not like to wear them. This is particularly the case in hot weather, when they can become fogged with condensation from the wearer's breath. When reasons for raising visors are given by deminers, they commonly make reference to a lack of optical clarity when looking through the visor. This may be blamed on light scratching, breath condensation, distracting optics (caused by reflections and refracted sunlight), airlessness and excessive heat. [The Victim's visor is shown below.]



67. There is sufficient damage inside the visor to suggest that it deflected environmental and mine-case fragmentation onto [the Victim's] face from the detonation of the PMN anti-personnel mine he was likely excavating at the time of the accident. From this it seems very likely that [the Victim] was using his trowel and excavating vertically over the mine with his visor at least partly raised.

[Damage to the Victim's body armour makes it likely that a closed visor would have also sustained significant damage low down.]



68. Interrogation of the online International Database of Demining Incidents and Victims, (www.ddasonline.com) shows that the eye protection issued to accident victim(s) was either not worn or worn in the raised position in more than 40% of all recorded accidents that have occurred during excavation of the ground (either area-excavation or the excavation involved with investigating a metal-detector signal). The result is often blindness in one or both eyes. The unusual severity of the head injury that incurred in this accident implies that the victim's head may have been closer to the device than usual. If the victim was crouching low over the device when he initiated it this may explain the unusually severe injury.

DETAILED ACCOUNT OF ACTIVITIES ON DAY OF ACCIDENT

69. The team's work at this task site started on 2 July after a tasking from TMAC to [International demining group] and a subsequent deployment from Dushanbe. The team arrived in the area during the afternoon of that day and set up their camp with accommodation tents and a field kitchen.
70. The day before the accident was a Sunday, a day of rest for the team, and most personnel, including [the Victim], went to the nearby town of Garm where they used the public bath house and ate lunch in various local restaurants.
71. Activities on the night before the accident followed a normal routine pattern and after eating dinner at about seven o'clock, team members, including [the Victim], watched television and then went to their beds between nine o'clock and ten-thirty, the same time as usual.
72. No evidence was found that any person at this task site was suffering from illness or sickness or had any reason to behave in any way that would be considered as out of the ordinary. No alcohol or drugs are permitted on the task site area and deminers are forbidden to consume alcohol during their tours of duty on operational tasks.
73. On the day of the accident, team members awoke and arose, as usual, at between four and four-thirty in the morning. No breakfast was taken by the team and, after a visit to the bathroom and latrine, a routine morning safety briefing was delivered by the Team Leader and all team members were at work in the minefield by 0500hrs.
74. Breakfast at this site depends on the availability of water. The site cook reports that, if water is available, team members have bread and tea with sugar and butter before starting work at 0500hrs. If water is not available first thing in the morning, then the team will instead receive breakfast after the cook has collected water from the local stream. On

such days this usually means that breakfast is taken at between six and seven o'clock in the morning.

75. The minefield clearance of the task site is in several separate areas. [The Victim] went to the Northern end of the minefield, started work and continued his duties of searching for landmines, working along the clearance lane towards a north westerly direction and using approved procedures, in accordance with normal working practices and [International demining group]'s published Standing Operational Procedures.
76. On returning to the clearance lane after the rest break, [the Victim] started to work by clearing a new one-metre wide lane next to the lane he had recently completed. He used a base stick, in accordance with [International demining group] SOP, to mark the limit of his exploration into the uncleared area and standard-issue tools to carry out the work of search and clearance within the lane.
77. A short distance along this new clearance lane [the Victim] was confronted by a rocky outcrop which he knew that he was required to clear in the same way as he would have cleared any other piece of ground.
78. [The Victim] is unable to recall what happened to him beyond this point. Informed conjecture based upon observations at the site and interviews with team members suggests that this is what happened:
 - p) [The Victim] was progressing from the south to the north along his clearance lane when he heard a signal from his metal detector to indicate that there was a piece of metal in the ground within the designated search area in front of him.
 - q) He began to investigate the signal, but it was within a hole amongst the rocks in front of him, in a place where he would have had to reach down at least half-a-metre in order to excavate the cause of the signal.
 - r) To avoid the problem of reaching down, he walked forward, within his search lane and over solid rock, to approach the area of the signal from the Northern end of his search lane.
 - s) Continuing his SOP drills he began to excavate the area of the source of the signal to the metal detector using the trowel issued to him for this purpose. He may not have been working to the SOP drill, as it seems likely that, because of the restricted area of work caused by the surrounding rocks, he was digging directly down to the mine, rather than digging across to the mine by excavating a small trench.
 - t) An explosion occurred when the PMN antipersonnel mine, which was the source of the metal detector signal, detonated.
79. At the time of detonation the area of ground wherein the mine was buried was in shadow, whilst at the same time the sun was rising over the horizon into [the Victim]'s face. This combination of light and shadow would probably have made observation more difficult than normal.
80. Marks made by the effects of explosive blast and shattered stones onto the rock around the crater suggest that the mine may have been laid at an angle, with the pressure plate aiming directly towards the direction from where [the Victim] was approaching.
81. A cut turf next to the crater and the position of the casualty after the detonation indicate that [the Victim] was approaching the mine from the western direction, facing east.

TIMELINE 21 AUG 2006 - THE DAY OF ACCIDENT

0400 or 0430: Morning wake-up call at Shull demining task site.

0430-0440: Morning routine.

0440-0450: Daily safety briefing from Supervisor [Name removed]

0500: Team starts work in Shull minefield.

0540: Section Leader – [Name removed] checks [the Victim]’s work before rest break.

0550-0600: First rest break of daily routine.

0616: Explosion.

06??: Team Leader [Name removed] phones [International demining group] HQ office in Dushanbe to inform about accident.

0620: Casualty recovered from point of explosion and carried on a stretcher to the medical point.

0622: Medics attend to casualty.

0630: Group begins descending the mountain, carrying casualty on a stretcher to the vehicle point.

0700: TMAC Quality Assurance Officer – [Name removed] receives first call from TMAC Manager - [Name removed] about the accident.

0715: [International demining group] Vehicle leaves site for the nearest hospital, located in the city of Garm.

0721: Casualty arrives at hospital, is admitted to emergency and transferred into operating theatre.

0735: TMAC Quality Assurance Officer arrives at MoD Centre for Helicopters in Aini.

0850: Helicopter leaves for Garm with TMAC QA Officer, [Name removed] (MoD), [Name removed] ([International demining group]), [Name removed] ([International demining group] operations Officer), [Name removed] ([International demining group] Translator), [Name removed] ([International demining group] team leader).

0940: Helicopter arrives at Garm airport.

1340: Casualty and two accompanying doctors leave hospital for airport with [QA Officer] (TMAC), [Name removed] (MoD), [Name removed] ([International demining group]).

1406: Helicopter leaves Garm.

1456: Helicopter arrives in Dushanbe and casualty is transferred to Russian Military Hospital.

1520: Casualty arrives at Russian Military Hospital and is taken to the operating theatre.

82. Selected statements from team members are shown at Annex L.

ORGANISATION OF IMMEDIATE REACTION

83. Medic [Name removed] states that during the immediate moments after the accident he contacted the nearby demining task site at Chorcharog to inform them about what had

happened. This caused medics and members of the team at Chorchao to drive to the ambulance point at Shull.

84. Medic [Name removed] also states that he instructed, by VHF radio, the driver of the [International demining group] truck at Shull to go to the hospital at Garm to inform them what had happened. Team Leader [Name removed] states that he too made this instruction by VHF radio.
85. At 7:20 [Name removed], chief of engineering services at MoD, received a phone call from TMAC National Director [Name removed] regarding the accident. At 7:25 at the Ministry of Defence the General began working on deploying a helicopter to retrieve the victim. The Air Force commander ordered a helicopter to depart at 7:50 am. When [Name removed] arrived in Garm 45 minutes later, [the Victim] was in the hospital.
86. Helicopter evacuation from Garm to Dushanbe was carried out in a satisfactory manner and the helicopter was made available promptly and efficiently.
87. [International demining group] initially reported that, probably due to the early hour of the day, on first arrival at the hospital in Garm *appropriate* doctors were not available to provide treatment to the injured deminer. It is most likely that this situation could have been improved if communications from the scene of the accident to the hospital had been established over a mobile telephone and perhaps a running commentary of the situation might then have been relayed to the hospital while doctors were being contacted.

SUMMARY

88. Injuries sustained by [the Victim] indicate very clearly that either he was not wearing his visor at the time the mine detonated in front of him, or the visor he was wearing was lifted away from his face and out of the collar of his protective apron.
89. Management and supervision at the task site could be improved. This applies from [the Victim] not requesting supervisory advice from his immediate supervisor, to the frequency of managerial and Quality Assurance visits to the task site.

CONCLUSIONS

90. It would be easy to conclude that this accident was the result of simple human error. However, at closer inspection it is apparent that this task site could be improved with more supervision from senior management and more attention to detail in reporting and during practices of casualty evacuation procedures.
91. The accident also underscores the need to ensure that deminers observe and maintain the standards they are taught during basic training. On realising that the initial signal on his metal detector emanated from a place on the ground which was difficult to access, [the Victim] should have called for assistance. It is likely that he would then have been advised to work around the rock systematically, or to start a new clearance lane to approach the signal from a new direction. More importantly, any such call for assistance should have led to a pause in [the Victim]'s work and provided an opportunity to think about the likelihood of danger ahead and consider appropriate actions to minimise the risks taken.

RECOMMENDATIONS

92. All members of the team involved in this accident should undergo at least three eight-hour days of refresher training and psychological counselling before being re-deployed to any demining task.
93. Adherence to Standing Operational Procedures. It is possible that the following routine SOP measures could have reduced the risk to deminer [the Victim]:
- u) All personnel at all work sites should conform to all aspects of [International demining group]'s Standing Operational Procedures. Specifically, this should mean that, when they are working within hazardous areas, personnel deployed on mine clearance operations should wear PPE complete with visor in the fully down position to completely cover the wearer's face.
 - v) If a deminer comes across a situation where normal SOPs do not apply, he should call the Section Leader, Team Leader or Supervisor. This gives pause to the operation, brings in a more senior person to assist the deminer and allows time for thought about what to do next. In the specific context of this demining accident, it is likely that the Section Leader, Team Leader or Supervisor would have advised that a fresh start should have been made to clear the lane from the North or North West direction.
94. [International demining group] should institute a system of husbandry, maintenance and quality control on all visors at every task site. This should include at least the following.
- w) Daily cleaning sessions.
 - x) Daily inspections by Section Leader, Team Leader or Supervisor.
 - y) Inspections of visors during senior staff visits to task sites.
 - z) Registration of serial numbers of each visor issued to each deminer.
 - aa) Annual renewal of every visor.
95. TMAC should deploy the national Quality Assurance Inspector to:
- bb) Check a percentage of deminers' visors at each task site as part of routine QA inspections.
 - cc) Monitor Casevac practices; this should be implemented in agreement with [International demining group].
 - dd) Check the on-site logbook thoroughly and ensure that all parts of the log are being used appropriately and accurately. This includes Attendance Sheets, Quality Control Logbook, Casevac Exercise Log, and all other pages in the logbook.
 - ee) Report on frequency of management visits to the site.
96. [The Victim] was on night-time sentry duty from 2 a.m. to 4 a.m. on the morning of the accident and may have been tired and hungry on that morning. [International demining group] should institute a formal regime of eating before work starts at the beginning of each day. Deminers should eat breakfast before starting work – there are recorded instances from other countries where deminers have been involved in demining accidents which were probably caused partly because their minds and bodies were not functioning properly first thing in the morning after working without sustenance since the night before.
97. [International demining group] should write an SOP to establish drills and procedures to be used by deminers when searching and clearing rocky outcrops.

98. [International demining group] should increase the frequency of management, supervisory, technical and Quality Assurance visits to task sites.
99. The local hospital should always be contacted by telephone during any incident which will involve a casualty being taken to the hospital.
100. As recommended in the Board of Inquiry report for the accident which occurred on 19 April 2006, a casualty evacuation exercise should be carried out from every task site during the first twelve hours at any newly appointed task site. This should be followed by a casualty evacuation exercise at least once each month. Such exercises should be recorded in the site log book together with the names of all personnel who carried out the exercise. In order to confirm communications, all casevac exercises should always include a telephone call from the task site to the local hospital. All personnel at the task site should be involved in the exercise and all appropriate personnel (at least medics and ambulance drivers) should travel from the task site all the way to the door of the hospital emergency department.
101. [International demining group] should ensure that all parts of on-site logbooks are properly completed on a daily basis.
102. As recommended in the Board of Inquiry report for the accident which occurred on 19 April 2006, the Board of Inquiry recommends again that, in order to better reflect good practices and recent developments in mine action, [International demining group] SOP should be reviewed and updated urgently.

Signed: UNDP Chief Technical Adviser; Chief of Engineering, Ministry of Defence; Quality Assurance Officer, TMAC

Annexes

Initial report of mine accident

Terms of Reference for Board of Inquiry

Example pages from Team's on-site logbook

1:50,000 Map

Images of site and general area

Sketch plan of the site

TMAC QA Report

Deminers' Job description

Details of PMN Anti Personnel Mine

Crater analysis

PPE images

Deminers' Statements

DISTRIBUTION: TMAC National Programme Director,; [International demining group]
Dushanbe; UNDP CO Dushanbe; DDIV/DDAS

Victim Report

Victim number: 645	Name: [Name removed]
Age: 19	Gender: Male
Status: deminer	Fit for work: no
Compensation: Not made available	Time to hospital: One hour, five minutes
Protection issued: Frontal apron Long visor	Protection used: Frontal apron, visor worn raised

Summary of injuries:

minor Arms

severe Face

severe Hands

severe Head

severe Legs

AMPUTATION/LOSS: Eyes

COMMENT: See Medical report.

Medical report

21 August, 2006

Extracts from the medical report of the patient stationed at the dispensary

DoB: 1987

Dates of : arrival to the hospital 21 August, 2006; left the hospital: 21 August, 2006

Diagnosis: Closed cranial-cerebral injury. Concussion to the brain. Open fragmentation fracture of the left cheekbone without dislocation. Both eyes: avulsion of eye-bulbs with prolepses and drainage of vitreous substance. Open fragmentation fracture of the left cheekbone.

Brief anamnesis, diagnostic examination, process of the disease, conducted treatment and status during the arrival and in the discharging period.

The patient [Name removed] (born in 1987) arrived in Central District Hospital (CDH) in Rasht in a very difficult condition. According to confirmations by his accompanying personnel, he was injured during mine clearance in a minefield on 21 August 2006 at approx. at 06:16. He was evacuated to the surgery department of the CDH by an ambulance. The general condition of the patient during his arrival in the hospital was very serious and he could not answer to questions. He was in a half-conscious like condition. Arterial pressure was 70/40. The pulse was 120 times per minute. During examination of the face a large crushed lacerated wound, necrotic webs, a torn rag of the left side of the cheek area and the area closed to ears were observed. Open fragmentation fracture of the left cheekbone without dislocation was also observed. After appropriate preparation, an initial operation of the injuries

of the face was done under the endo- tracheal narcosis. The torn rag of the left side of the cheek was sewn layer by layer. Drainage-tubes and aseptic bandage were installed.

21 August, 2006

Signed: Attending physician

The pictures below show the Victim before and after surgery.



Photographs showed one leg bandaged top to bottom, the other peppered with small fragmentation wounds at the thigh. Both hands were bandaged and bloody with lacerations of the fingers.

31st August 2006 below



Email 21st August 2006 from Demining group National manager:

"Today the operator had another surgery in Russian military hospital for 1hr 30min on his eyes. No frags in his skull. I've talked with the doctor who made surgery, she said that [the Victim] lost sight in both eyes."

STATEMENTS

Statement no.1: Team Leader, MAT 1

On 21 August 2006 I, [Name removed], woke up at 04:30 and lined the team members up and briefed them about safety instructions and compliance with them and sent all the deminers and section leaders to the site. All the deminers began to work at 5 o'clock sharp. At 5:50 I whistled for "10 minutes' break". After break everybody was back to his clearance lane. I went to the deminer [Name removed]'s lane and was giving him some advice when at this moment, at approx. at 6:16 there was an explosion at the deminer [the Victim]'s site. The Team Leader [Name removed] immediately shouted in the radio: Mine Accident! Mine Accident! I ordered the deminers [Name removed] and [Name removed] to bring the stretcher and I hurried to the site of the accident. When I reached the location, the deminers who worked closer to [the Victim] as well as the Team Leader [Name removed], were already

there. The deminer [Name removed] checked around the mine victim with a mine detector and the victim was evacuated on the stretcher from the mine field up to the medic. The medics offered first aid to him. At approx. at 6.30 hrs I informed [Name removed] – [International demining group] National Manager – by my mobile phone. Then, I sent [International demining group] driver [Name removed] to the Central District Hospital in Rasht to inform the doctors to be ready. At this moment we carried the mine victim down from the mountain and took him to the hospital by [International demining group] ambulance. The doctors examined the victim and asked me to call the [International demining group] HQ in Dushanbe to send a helicopter to evacuate the victim to Dushanbe Hospital. I called [Name removed] by my mobile phone. The helicopter arrived at 09:45 hrs. At approx. 10 o'clock the following personnel arrived at Garm Hospital: [Name removed], [Name removed], [Name removed], [Name removed] and [Name removed]. At about 13:50 hrs the doctors finished operating on the mine victim and then the victim was taken to the airport and was evacuated by helicopter to Dushanbe together with one of the [International demining group] medics doctor [Name removed], [Name removed] and [Name removed]. I wrote the statement myself and have nothing to add.

Signed: 22 August, 2006

Statement no.2: deminer: MAT 1

On 21 August, 2006 I, [Name removed], woke up at 04:30. I put on my PPE. After listening to the safety briefing from my supervisor I signed the Safety Briefings Logbook and walked to the minefield. At my lane, I fixed the tapes which were opened due to the wind. I began mine clearance for 50 minutes. Later the Team Leader came and tested my cleared lane with a mine detector. Then we had a break for 10 minutes and returned to begin mine clearance again. After some minutes there was an explosion. The Team Leader shouted: Mine Accident! I closed my lane and ran towards the mine victim. I wrote the statement myself and have nothing to add.

Signed: 21 August, 2006

Statement no.3: Medic: MAT 1

On 21 August 2006 I, [Name removed] – [International demining group] Medic, MAT 1, woke up at 04:30 together with other team members. At 04:50 I went to the medical point. At 05:50 the deminers stopped the work for a break and in 10 minutes they were back to their sites and began working. At approx. 06:16 a mine accident occurred and the team leader [Name removed] informed me by radio that a mine accident occurred and [the Victim] is injured. Medic [Name removed], who was farther away in his station called me by radio. I asked him if he could come to the medic's point. He came. The victim was brought to us within 5 minutes after the accident. We - both medics offered the first aid to the victim. In 7-8 minutes we began to evacuate the victim and at about 07:20 we took the victim to the Central District Hospital in Garm. The doctors at the hospital offered their assistance. Later we were told by Dushanbe office that a helicopter is coming for assistance. At about 15:00-15:10 we put the victim on board of the helicopter. Medic [Name removed] joined the victim in the helicopter and went to Dushanbe and I remained with the team. I wrote the statement myself and have nothing to add.

Signed: 22 August, 2006

Statement no.4: Cook and deminer: MAT 1

On 21 August 2006 I, [Name removed], woke up at 04:30. After tidying the yard, I was making breakfast for the deminers when I suddenly heard the explosion. I wrote the statement myself and have nothing to add.

Signed: 21 August, 2006

Statement no.5: Section One Leader

On 21 August 2006 I, [Name removed], woke up at 04:30. I put on my PPE and lined the team members up and briefed them about safety instructions together with [Name removed]. I and all the deminers signed in the Safety Briefings Logbook and went to the minefield. All the deminers began to work at 5 o'clock sharp. At 5:50 the Team Leader whistled for "10 minutes' break". After 10 min. the Team Leader called everybody back to work. I began to inspect all the deminer's performance. I was inspecting deminer [Name removed]'s work when suddenly, at approx. at 6:16 hrs, there was an explosion. The Team Leader [Name removed] immediately shouted: Mine Accident! I saw dust at the deminer [the Victim]'s site. I hurried towards the site of the mine accident. The Team Leader [Name removed] and [Name removed] were already there. The victim was evacuated on the stretcher from the mine field up to the medics. The medics offered their first aid to him. Together with the Team Leader [Name removed], both medics and 12 deminers carried the victim down to the ambulance. Then the Team Leader [Name removed] together with both medics and 7 deminers took the victim to the Central District Hospital in Rasht by [International demining group] ambulance. I, together with 5 deminers, remained and went back to the campsite. I wrote the statement myself and have nothing to add.

Signed: 22 August, 2006

Statement no.6: Section leader, MAT 1

On 21 August, 2006 I, [Name removed], Section leader, MAT 1 woke up at 04:30. I put on my PPE. After listening to the safety briefing from my supervisor, I signed the Safety Briefings Logbook and walked over to the minefield. I cleared the mined area at my lane for 50 minutes. Then we had a 10-minute break. After 15-20 minutes after the break, I heard an explosion and ordered the deminers to stop mine clearance. I immediately went towards the mine victim. We evacuated him from the minefield and took him to the medic. I wrote the statement myself and have nothing to add.

Signed: 21 August, 2006

Statement no.7: deminer from MAT 1

On 21 August 2006 I, [Name removed], woke up at 04:30. I put on my PPE. After listening to the safety briefing from my supervisor I signed the Safety Briefings Logbook and walked to the minefield to my lane and fixed the tapes which were opened due to the wind. Then, I began mine clearance. Later the Team Leader came and tested my cleared lane with a mine detector. In Approx. 15-20 min. after the break, there was an explosion and I saw how deminer [the Victim] was thrown about one metre away from where he was working. The Team Leader ordered the deminers to stop mine clearance. I closed my lane and went towards the mine victim. The Team Leader instructed us to place the victim on the stretcher

and evacuated him from the minefield up to the medic. I wrote the statement myself and have nothing to add.

Signed: 21 August, 2006

Analysis

The primary cause of this accident is listed as “Inadequate training” because it seems that the Victim encountered an unusual situation with a mine placed in a cleft between rocks. Instead of asking for instructions, he raised his visor and worked on the mine from directly above, so putting his face inside the fragmentation cone associated with an AP mine blast.

The secondary cause is listed as a “Field control inadequacy” because the Victim had raised his visor and begun to work in a very dangerous position but his errors were not corrected. The fact that the International demining group did not have SOPs for the situation and had not revised their SOPs as required after previous accidents is a significant “Management control inadequacy”. The fact that the SOPs had still not been revised over a year later adds to the impression of an uncaring/incompetent management team.

The Victim was a 19 year old conscript soldier, with the physique of a boy, as illustrated in the arm injury shown below.



It is unfortunate that pictures of the accident investigation show International demining group expatriate investigators at the site wearing no PPE. This obviously sets a very bad example. They were inside a partly cleared minefield and – according to National standards and the demining group’s SOPs – should have been wearing PPE. The Bol investigators all wore PPE at the accident scene.

The International demining group investigators below are on the rocky outcrop where the accident occurred. The fact that they gave the picture to the Bol implies that they did not know that they were in breach of their own SOPs.



The “Inadequate medical provision” listed under Notes refers to the fact that no CASEVAC practice had been conducted and the Supervisor did not know how to react when the accident occurred. He sent a “runner” down the mountain to the hospital rather than use his telephone.

This Bol is unusually thorough and one of the best on record. If it has a failing, it is that the National Authority displayed an unusual degree of patience over the failure of the

International demining group involved to take its previous post-accident requirements seriously. The demining group was the only one operating in-country and there was an understandable reluctance to suspend its operations.